Amendment and Response
Applicant: John Wade et al.
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Title: WIDE ARRAY FLUID EJECTION DEVICE

IN THE CLAIMS

Please cancel claims 4, 6, 20, 21, 29, 32-35, and 37-43 without prejudice.

Please amend claims 1, 2, 5, 7-13, 15, 17, 18, 22-28, 31, and 36 as follows:

1. (Currently Amended) A fluid ejection device comprising:

a first set of N memory elements each storing a fire enable value, ~~each of the N memory elements configured to be updated~~ the fire enable value including one of an enabling value or a disabling value;

a second set of N memory elements each storing a different one of N image data sub-blocks of an image data block, each image data sub-block including one of an enabling value or a disabling value;

a third set of N memory elements each storing and receiving a different one of the N image data sub-blocks from a different one of the second set of N memory elements; and

~~N fluid ejecting elements, each fluid ejecting element corresponding to a different one of the N memory elements and configured to receive the fire enable value from the corresponding memory element, wherein the fluid ejecting element is enabled to eject a fluid when the fire enable value is an enabling value~~

N fluid ejecting elements each receiving the fire enable value from a corresponding one of the first set of N memory elements and the image data sub-block from a corresponding one of the third set of N memory elements, wherein one of the fluid ejecting elements is enabled to eject a fluid when the fire enable value and the image data sub-block each are the enabling value.

2. (Currently Amended) The fluid ejection device of claim 1, wherein the first set of N memory elements and each of the N fluid ejecting elements are formed on a ~~thin film~~ thin-film structure formed on a substrate including a non-conductive material selected from a group consisting of an oxide formed on a metal, a carbon composite material, a ceramic material, and glass.

3. (Original) The fluid ejection device of claim 1, wherein the N fluid ejecting elements are configured as a row that extends substantially for a width of a page of print media.

4. (Cancelled)

5. (Currently Amended) The fluid ejection device of ~~claim 4~~ claim 1, wherein the image data block comprises a row of image data and each image data sub-block comprises a bit of image data.

6. (Cancelled)

7. (Currently Amended) The fluid ejection device of ~~claim 6~~ claim 1, wherein the first, second, and third sets of N memory elements each comprise a shift register having N memory elements.

8. (Currently Amended) The fluid ejection device of ~~claim 6~~ claim 1, ~~wherein each of the N memory elements of the second set of N memory elements corresponds to a different one of the N memory elements of the third set of N memory elements, and~~ wherein the ~~second~~ third set of N memory elements is configured to receive the image data block from the ~~third~~ second set of N memory elements in response to a load enable signal.

9. (Currently Amended) The fluid ejection device of ~~claim 6~~ claim 1, ~~wherein after the second set of N memory elements receives the third set of N memory elements is configured to serially receive and store N sub-blocks of a next image data block~~ wherein after the third set of N memory elements receives the N image data sub-blocks from the second set of N memory elements, the second set of N memory elements is configured to serially receive and store N image data sub-blocks of a next image data block.

10. (Currently Amended) The fluid ejection device of ~~claim 4~~ claim 1, ~~wherein the each of the N fluid ejecting elements corresponds to a different one of the N memory elements of the second set of N memory elements and is configured to receive upon each cycle of the~~

~~clock the image data sub-block from the corresponding memory element, wherein the fluid ejecting element generates an ink droplet when the fire enable value is the enabling value and when the image data sub-block is the enabling value~~ wherein each of the N fluid ejecting elements is configured to receive upon each cycle of a clock the image data sub-block from the corresponding one of the third set of N memory elements.

11. (Currently Amended) The fluid ejection device of ~~claim 10~~ claim 1, ~~wherein the fluid ejecting element does not generate an ink droplet~~ wherein the one of the fluid ejecting elements is not enabled to eject the fluid when one of the fire enable value or the image data sub-block is the disabling value.

12. (Currently Amended) The fluid ejection device of ~~claim 10~~ claim 1, wherein the N fluid ejecting elements are configured to print a block of image data in a print cycle, ~~and~~ wherein the first set of N memory elements is configured to serially receive in the print cycle a series of fire enable values representative of a fire enable pulse, and wherein the first set of N memory elements receives a fire enable value upon each cycle of the clock, with a first fire enable value of the series being received upon a first clock cycle of the print cycle and a last fire enable value of the series being received upon a last clock cycle of the print cycle.

13. (Currently Amended) The fluid ejection device of claim 12, wherein a first X fire enable values of the series received during a first X clock cycles of the print cycle are ~~enablingvalues~~ enabling values and a remaining N fire enable values of the series received during a remaining N clock cycles of the print cycle are disabling values such that the enabling values propagate through the first set of N memory elements in a print cycle, wherein at an end of the print cycle each of the N memory elements of the first set of N memory elements is storing the disabling value.

14. (Original) The fluid ejection device of claim 13, wherein a product of X multiplied by a duration of the clock cycle substantially equals an enable pulse duration.

15. (Currently Amended) The fluid ejection device of ~~claim 4~~ claim 1, wherein each of the N fluid ejecting elements comprises:

a logic element configured to receive ~~a fire enable value from the corresponding fire enable shift register memory element and to receive an image data sub-block from the corresponding memory element of the hold shift register~~ the fire enable value from the corresponding one of the first set of N memory elements and the image data sub-block from the corresponding one of the third set of N memory elements, and to provide a power switch control signal having a first state when the fire enable value and the image data sub-block each are the enabling value;

a heater resistor having a first terminal connectable to a power source and a second terminal; and

a switch coupled between ~~the second heater resistor terminal and ground and receiving the switch control signal at control, and configured to connect the second terminal of the heater resistor to ground when the switch control signal has the first state~~ the second terminal of the heater resistor and ground, the switch configured to receive the power switch control signal and connect the second terminal of the heater resistor to ground when the power switch control signal has the first state.

16. (Original) The fluid ejection device of claim 15, wherein the switch comprises:

a field effect transistor having a gate coupled to the logic element, a drain coupled to the second terminal of the heater resistor, and a source coupled to ground.

17. (Currently Amended) The fluid ejection device of claim 15, wherein the logic element comprises:

an AND-gate having a first input coupled to the corresponding ~~memory element of the fire enable shift register~~ one of the first set of N memory elements, a second input coupled to the corresponding ~~memory element of the data hold shift register~~ one of the third set of N memory elements, and an output providing the power switch control signal.

18. (Currently Amended) A fluid ejection device comprising:

~~a series of N memory elements configured to serially receive a series values including at least one enabling value and to serially transfer the series of values through the series of N memory elements~~

a fire enable register including a series of N memory elements configured to serially receive and serially transfer a series of fire enable values through the series of N memory elements;

a data input register including a first set of N memory elements each storing an image data bit of a row of image data;

a data hold register including a second set of N memory elements each coupled to and configured to receive the image data bit from a different one of the first set of N memory elements; and

~~N fluid ejecting elements, each fluid ejecting element coupled to a different one of the N memory elements and configured to receive the value from the corresponding memory element, wherein each fluid ejecting element is enabled to eject a fluid when the corresponding value has the at least one enable state~~

N fluid ejecting elements each coupled to and configured to receive one of the fire enable values from a different one of the series of N memory elements, and coupled to and configured to receive the image data bit from a different one of the second set of N memory elements, wherein each fluid ejecting element is enabled to eject a fluid when the one of the fire enable values and the image data bit each are an enabling value.

19. (Original) The fluid ejection device of claim 18, wherein the series of N memory elements and each of the N fluid ejecting elements are formed on a thin-film structure formed on a substrate including a non-conductive material selected from a group consisting of an oxide formed on a metal, a carbon composite material, a ceramic material, and glass.

20. (Cancelled)

21. (Cancelled)

22. (Currently Amended) The fluid ejection device of ~~claim 21~~ claim 18, wherein the ~~set~~ series of N memory elements and the first and second set of N memory elements each comprise a shift register having N memory elements.

23. (Currently Amended) The fluid ejection device of ~~claim 21~~ claim 18, wherein each of the N memory elements of the ~~first~~ second set of N memory elements corresponds to a different one of the N memory elements of the ~~second~~ first set of N memory elements, wherein the ~~first~~ second set of N memory elements is configured to receive a present row of image data from the ~~second~~ first set of N memory elements in response to a load enable signal, and wherein the ~~second~~ first set of N memory elements is configured to serially receive a next row of image data after providing the present row of image data to the ~~first~~ second set of N memory elements.

24. (Currently Amended) The fluid ejection device of ~~claim 23~~ claim 18, wherein each of the N fluid ejecting elements corresponds to a different one of the N memory elements of the ~~first~~ second set of N memory elements and is configured to receive upon each cycle of a clock the image data bit from ~~the corresponding memory element, wherein the fluid ejecting element is configured to eject an ink droplet when the fire enable value is the enabling value and when the image data bit is the enabling value, and wherein the fluid ejecting element does not eject an ink droplet when either the fire enable value or the image data bit is the disabling value~~ a corresponding one of the N memory elements, wherein the fluid ejecting element does not eject the fluid when either the one of the fire enable values or the image data bit is a disabling value.

25. (Currently Amended) The fluid ejection device of ~~claim 24~~ claim 18, wherein the N fluid ejecting elements are configured to print ~~a~~ the row of image data in a print cycle.

26. (Currently Amended) The fluid ejection device of claim 25, wherein the series of N memory elements is configured to serially receive during the print cycle a fire enable pulse comprising a series of the fire enable values, wherein the series of N memory elements receives one fire enable value of the series upon each cycle of the clock.

27. (Currently Amended) A method of enabling N fluid ejecting elements of a fluid ejection device ~~to generate an ink droplet~~, the method comprising:

holding an image data value in each of N memory elements of an image data hold register, each memory element corresponding to a different one of the N fluid ejecting elements, each image data value being one of an enabling value or a disabling value;

storing a fire enable value in each of N memory elements of a fire enable shift register, ~~wherein each memory element corresponds~~ each memory element corresponding to a different one of the N fluid ejecting elements, each fire enable value being one of an enabling value or a disabling value;

updating the fire enable value in each of the N memory elements of the fire enable shift register ~~from~~ with a fire enable value from an adjacent memory element upon each cycle of a clock; and

~~providing upon each cycle of the clock to each of the N fluid ejecting elements the fire enable value from the corresponding memory element for the fire enable shift register, wherein the fluid ejecting element is enabled to generate an ink drop when the fire enable value has the enable sate~~

upon each cycle of the clock, providing to each of the N fluid ejecting elements the fire enable value from the corresponding memory element of the fire enable shift register and the image data value from the corresponding memory element of the image data hold register, wherein a fluid ejecting element is enabled to eject a drop of fluid when the fire enable value and the image data value each are the enabling value.

28. (Currently Amended) The method of claim 27, further comprising:

~~storing an image data value in each of N memory elements of an image data shift register, wherein each memory element corresponds to a different one of the N fluid ejecting elements, each image data value being one of an enabling value or a disabling value~~

receiving the image data value of each of the N memory elements of the image data hold register in each of N memory elements of an image data input register, each memory element corresponding to a different one of the N memory elements of the image data hold register; and

shifting the image data value of each of the N memory elements of the image data input register to the corresponding memory element of the image data hold register.

29. (Cancelled)

30. (Original) The method of claim 27, further comprising:

receiving serially in a print cycle at the fire enable shift register a series of fire enable values representative of a fire enable pulse, wherein the fire enable shift register receives a fire enable value upon each clock cycle of the print cycle with a first enable value of the series being received upon a first clock cycle of the print cycle and a last fire enable value of the series being received upon a last clock cycle of the print cycle.

31. (Currently Amended) The method of claim 30, further comprising:

~~receiving~~ a first X fire enable values of the series being enabling values during a first X clock cycles of the print cycle and a remaining N fire enable values of the series having ~~the disable state~~ a disabling value during a remaining N clock ~~cycle~~ cycles of the print cycle such that the first X fire enable values being enabling values propagate through the N memory elements of the fire enable shift register in a print cycle thereby sequentially enabling each of the N fluid ejecting elements ~~to generate an ink droplet~~ to eject a drop of fluid for a duration substantially equal to a product of X multiplied by a duration of a clock cycle.

32-35. (Cancelled)

36. (Currently Amended) A fluid ejection device comprising:

N fluid ejecting elements;

means for storing N image data values each corresponding to a different one of the N fluid ejecting elements and each being one of an enabling value or a disabling value;

means for receiving and shifting the N image data values to the means for storing the N image data values;

means for storing N fire enable values each corresponding to a different one of the N fluid ejecting elements and each being one of an enabling value or a disabling value; and

means for serially transferring each of the N fire enable values upon each cycle of a clock and for providing to each of the N fluid ejecting elements upon each cycle of the clock the corresponding fire enable value from ~~the storage means, wherein the fluid ejecting element is enabled to generate an ink drop when the fire enable value is an enabling value~~ the means for storing the N fire enable values and the corresponding image data value from the means for storing the N image data values, wherein a fluid ejecting element is enabled to eject a drop of fluid when the fire enable value and the image data value each are the enabling value.

37-43. (Cancelled)